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Floristic enumeration of the dicotyledonous plants in *Vellayani* lake area, Thiruvananthapuram district, Kerala

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Abstract

The present paper narrates the dicotyledonous plant species in Vellayani Lake area. Vellayani Lake is one of the three rain fed fresh water lakes in Kerala and the biggest one in the Thiruvananthapuram district. The Vellayani Lake is rich in floral diversity typical to that of a wetland ecosystem. Members of Asteraceae, Rubiaceae, Verbenaceae, Cucurbitaceae, Euphorbiaceae, Malvaceae, Capparidaceae, Nymphaeaceae, Lamiaceae, Apocynaceae, Verbenaceae etc are dominated in the wetlands and are noticed along the fringes. The present field study contains of around 50 dicot plants in which 2 are hydrophytes of Nymphaeaceae family and others are present in the Lake area side. Wetlands are important repositories of aquatic biodiversity. The main objectives of the work are to undertake floristic survey of Vellayani lake area of Thiruvananthapuram district and to prepare an inventory and to suggest remedial measures to revive the lake.

Keywords: Angiosperms, Dicots, Fresh Water Lake, Vellayani Lake, Thiruvananthapuram,

Introduction

The flora of India is one of the richest in the world owing to the wide range of climate, topography and habitat in the country. There are estimated to be over 18,000 species of flowering plants in India, which constitute 7% of the total plant species in the world. According to Nayar *et al.* (1996) about 5725 species of flowering plants are broadly

considered as endemics and represent 33.5% of the flora, of which, 3471 species are found in the Himalayas, 2051 in the Peninsular India and 231 in Andaman & Nicobar Islands, whereas 15 genera are widely distributed throughout the country. However, according to recent estimation about 4045 taxa belonging to around 15 genera in 155 families are considered as strict endemics to the present political boundary; dicotyledons dominate the endemic flora with 2984 taxa (74%) under 720 genera in 128 families whereas monocotyledons are represented by 1061 taxa (26%) belonging to 255 genera under 27 families. The northeast India, with the presence of over 130 species of primitive angiosperms is also considered as a "cradle of flowering plants" (Takhtajan, 1996). India is also recognized as one of the world's 12 Vavilovian centers of origin and diversification of cultivated plants known as the 'Hindustani Center of Origin of Crop plants' (Vavilov, 1951). At least 167 species of important agri-horticultural crops and 320 species of their wild relatives, belonging to 116 genera and 48 families, are known to have originated here (Arora and Nayar, 1984).

The Western Ghats biogeographic zone comes next to Himalaya in floristic richness and diversity. About 7,402 species of flowering plants in the Western Ghats have been recorded (Nayar *et al.*, 2014). Among them, 5,588 species are native or indigenous to the Western Ghats. Of the rest, 376 are exotics naturalized and 1,438 species are cultivated or planted as ornamentals. Among the indigenous species, 2,253 species are endemic to

India and of them, 1,273 species are exclusively confined to the Western Ghats. Kerala is the southernmost state along the western coast of Peninsular India. The state has a total area of 38,683sq.km, which constitutes 1.8% of the total geographical area of India. Western Ghats covers 72.08% of the total geographical area of the state (Sudha, 2011). At present, the state has an area of 11125.5 sq. km, which constitutes 28.63% of the total geographical area. Though the angiosperm diversity of wetlands in Kerala is not yet fully explored and understood among the scientific community. Angiosperms in wetland are very essential to evaluate the present conservation status as well as to formulate future strategies. In this juncture, the present study aims for the collection, identification and documentation of the dicots in the Vellayani Lake Area of Thiruvananthapuram District.

Materials and Methods

The present study was under taken to enumerate the dicotyledons flora of the Vellayani lake of Thiruvananthapuram district. For the collection of specimens, several visits were conducted year-round till ample data of each species. Field's data were noted in the field book at the time of specimen collection. Photographs were taken at the time of collection to observe habits and localities. Most of the common plants available in the area were collected and studied their morphological and taxonomical studies. Herbaria were prepared for the collected plants by using the following standard method.

Herbarium Preparation

The collected specimens were later on pressed in between blotting paper or newspaper. The blotting papers with plant specimens are then kept tightly pressed in the wooden press for 5-7 days according to the nature of specimens, or till the specimens are getting dried properly. The dried specimens were further poisoned with Mercuric chloride and then mounted on mounting sheets of standard size. Stiff parts of woody plants are usually stitched to the sheet further ready for identification.

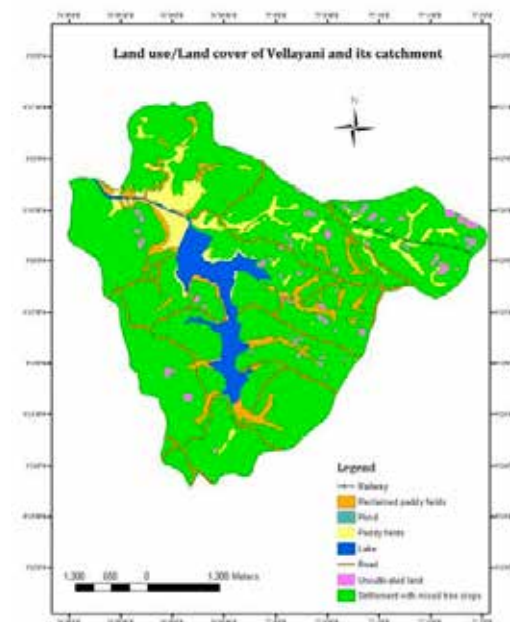
Identification

The collected specimens were critically studied and identified with the help of authentic taxonomic literatures by Gamble and Fischer (1915-1936), Daniel, (2005), Nayar *et al.* (2006), Sasidharan (2006), Nayar *et al.* (2014) etc. The herbarium specimens were compared with the authenticated specimens housed at TBGT,

UCT and is deposited in the herbarium of the Department of Botany, Christian College, Kattakkada, Thiruvananthapuram for future study.

The Area of Study

Vellayani Lake (8°24'2 - 8°26'2 N and 76°59'2 -76°59'2 E), the second largest freshwater lake in Kerala state, India, is the major freshwater resource of Southern Kerala. The lake occupies an area of about 3.312 km² and has a mean depth of 1.2 m (Gopinath, 2003). The lake is bordered by Thiruvallom and Nemom villages of Neyyattinkara Taluk. Major part of the lake is stagnant but a small portion flows to Karamana River. It is the main source of water supply to four neighbouring panchayats. Lake has a water spread area of 398 ha. The length of the lake is about 3.15 km and at its maximum width is about 1000m; depth of the lake varies from 2 to 6m. It is about 9 km away from the Thiruvananthapuram central bus station. It is at a distance of 7 km from Kovalam via Poonkulam junction. A road passes through this lake, a bund has been constructed for this purpose. This lake attracts a lot of tourist. Topography of the town is rather uneven, with higher areas in the downtown. The geology is said to be typical of the Kerala soil- the Laterite and Red soil. The town can still boast of a good green cover in residential and non- residential areas. The average annual temperature is 27.2°C (81.0°F), the average summer temperature is 35°C (95°F) and the average winter temperature is 24.4°C (75.9°F).



Map of the study area

Results and Discussion

During the present study 50 species of dicotyledons were collected from the study area. On analysis, they belong to 47 genera in 21 families. The herbaceous species represented by 27 species is the largest members in the study sites, followed by subshrubs or shrubs with 10 species. Trees are represented by 7 species whereas 6 species are climbers. Fabaceae and Asteraceae are the first dominant families with 7 species each, followed by Rubiaceae with 6 species subsequently Acanthaceae and Cucurbitaceae with 3 species each. Family Combretaceae, Euphorbiaceae, Nyctaginaceae, Nymphaeaceae and Verbeneaceae

are with 2 members each. Family Capparidaceae, Portulacaceae, Sterculiaceae, Onagraceae, Apiaceae, Scrophulariaceae, Lamiaceae and Loranthaceae have one species each. Family Loranthaceae is with single endemic species *Helicanthes elasticus*, which caused severe damage to their host plant. It is estimated that about 34% of the flora are exotics. These may be introduced either as ornamentals or being naturalized in the study sites. The species are enumerated according to the alphabetical order of species along with their family name, habit, flowering and fruiting periods, geographical distribution, etc. and the photographs of the plants are given as five plates.

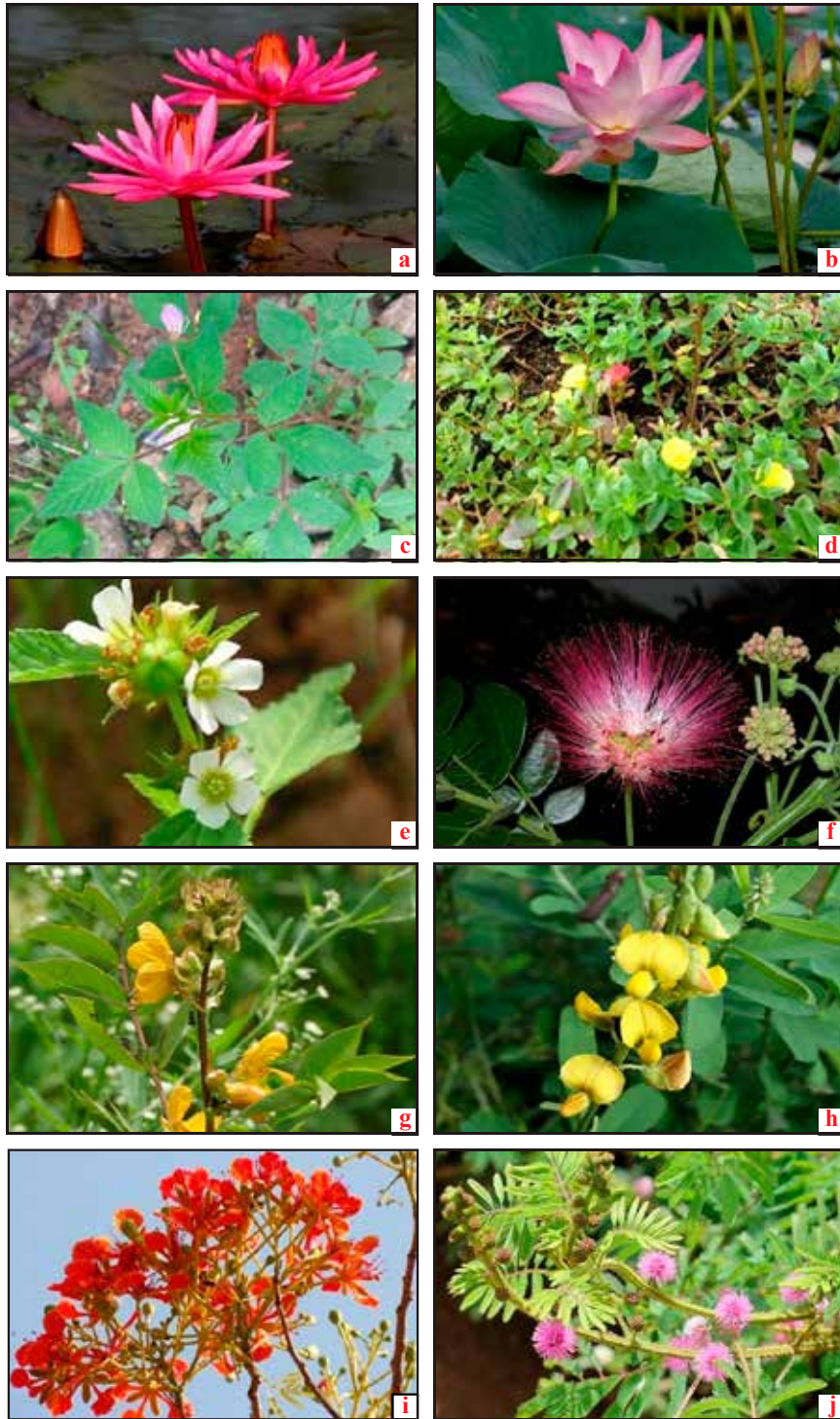
Table 1
Details of Plants collected in Vellayani Lake area

Sl No.	Plant name	Family	Habit	Flowering and fruiting	Geographical distribution
1	<i>Cleome rutidosperma</i> DC.	Capparidaceae	Annual erect or decumbent herb	Aug.-Jan.	South and East Asia
2	<i>Nelumbo nucifera</i> Gaertn.	Nymphaeaceae	Perennial herbs	Aug.-Jan.	South and East Asia
3	<i>Nymphaea pubescens</i> Willd.	Nymphaeaceae	Perennial herbs	Nov.-Dec.	India, SriLanka, South East Asia, Africa, Hungary
4	<i>Portulaca grandiflora</i> Hook.	Portulacaceae	Diffuse herbs	Aug.-Jan.	Native to Bolivia to Brazil and Argentina
5	<i>Melochia corchorifolia</i> L.	Sterculiaceae	Erect branched herbs	Aug.-Jan.	India, SriLanka, Pantropics
6	<i>Albizia saman</i> (Jacq.) F.Muell.	Fabaceae	Trees	Aug.-Jan.	South and East Asia
7	<i>Cassia siamea</i> Lam.	Fabaceae	Trees	Aug.-Jan.	South and East Asia
8	<i>Crotalaria retusa</i> L.	Fabaceae	Erects herbs or subshrubs	Aug.-Jan.	India, SriLanka, Bangladesh, Nepal, Pakistan, Myanmar, China, Taiwan, Thailand, Vietnam
9	<i>Delonix regia</i> (Hook.) Raf.	Fabaceae	Trees	Aug.-Jan.	Native to Madagascar
10	<i>Mimosa diplotricha</i> C. Wright	Fabaceae	Rambling shrubs	Aug.-Jan.	Native to Java
11	<i>Pueraria tuberosa</i> (Willd.) DC.	Fabaceae	Large climbing shrubs with tuberous roots	Aug.-Jan.	India, Nepal, Pakistan
12	<i>Racosperma auriculiforme</i> (Benth.) Pedley	Fabaceae	Trees	Aug.-Jan.	India, Nepal, Pakistan

13	<i>Quisqualis indica</i> L.	Combretaceae	Woody climbers	Sep.-Nov.	India, SriLanka, Old World Tropics
14	<i>Terminalia catappa</i> L.	Combretaceae	Trees	Jan.-March	India, SriLanka, China, Tropical Asia
15	<i>Ludwigia glandulosa</i> Walter.	Onagraceae	Aquatic floating herbs	Apr.-June	India, SriLanka, Old World Tropics
16	<i>Cucumis melo</i> L.	Cucurbitaceae	Robust annuals	May-July	India, SriLanka, Pantropics
17	<i>Trichosanthes tricuspidata</i> Lour.	Cucurbitaceae	Scabrid climbing herbs	Dec.-Feb.	India, SriLanka, China, Myanmar, Laos, Cambodia, Thailand
18	<i>Trichosanthes anguina</i> L.	Cucurbitaceae	Annuals	Mar.-May	Tropic Asia
19	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Prostrate herbs	Apr.-June	India, SriLanka, Tropical and Subtropical Asia
20	<i>Gardenia jasminoides</i> J.Ellis	Rubiaceae	Bushy shrubs	Oct.-Dec.	Native to East Asia
21	<i>Hedyotis corymbosa</i> Wall.	Rubiaceae	Herbs or under shrubs	Dec.- Feb.	India, SriLanka, Philippines, Java, Tropical Africa, America
22	<i>Hedyotis auricularia</i> Walter.	Rubiaceae	Coarse herbs	Oct.-Jan.	Endemic to India
23	<i>Morinda citrifolia</i> L.	Rubiaceae	Evergreen shrubs or small crooked trees	May.-Aug.	India, SriLanka, Malaysia, Australia, Pacific Islands
24	<i>Spermacoce hispida</i> L.	Rubiaceae	Herbs	May-Aug.	India, SriLanka, China, Laos, Cambodia, Vietnam, Malay Archipelago, Tropical Africa
25	<i>Spermacoce ocymoides</i> Burm.f.	Rubiaceae	Pubescent, erect herbs	Nov.- Dec.	India, Myanmar, Malaysia, Tropical Africa, Tropical America
26	<i>Chromolaena odorata</i> (L.)R.M.King&H.Rob.	Asteraceae	Shrubs	Nov.-May	Native of America
27	<i>Crassocephalum crepidiodes</i> (Benth.) S.Moore	Asteraceae	Tall herbs	Aug.-Dec.	Native to Tropical Africa
28	<i>Eclipta prostrata</i> (L.)L.	Asteraceae	Herbs	Throughout the year	Pantropics, India, Sri Lanka
29	<i>Mikania micrantha</i> (L.) Willd.	Asteraceae	Climbers	Feb.-April	Native to Tropical America
30	<i>Strutchium sparganophorum</i> (L.) Kuntze	Asteraceae	Erect semi-aquatic herbs	Aug.- Feb.	Native to Tropical America

31	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Erect herbs	Throughout the year.	Native of West Indies.
32	<i>Wedelia trilobata</i> (L.) Pruski	Asteraceae	Herbs	June-Sep.	Native of America
33	<i>Allamanda cathartica</i> L.	Apocynaceae	Straggling shrubs	Throughout the year	Tropics
34	<i>Adhatoda vasica</i> L.	Acanthaceae	Perennial shrubs	Throughout the year	India, SriLanka, Pakistan, Cambodia, Singapore
35	<i>Asystasia gangetica</i> (L.) T.Anderson	Acanthaceae	Perennial shrubs	Sep.-Dec.	India, SriLanka, South West Asia, Africa
36	<i>Ruellia tuberosa</i> L.	Acanthaceae	Glabrescent herbs	March-Nov.	Native to Tropical America
37	<i>Clerodendrum infortunatum</i> L.	Verbanaceae	Shrubs	Dec.-Feb.	India, SriLanka
38	<i>Tectona grandis</i> L.f.	Verbanaceae	Deciduous trees	May-Jan.	India, SriLanka, Myanmar
39	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Shrubs	Aug.-Feb.	Native to Tropical America
40	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Annual or perennial herbs	Throughout the year	Native to Tropical America
41	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Herbs	Aug.-Dec.	India, SriLanka, Nepal, Myanmar, China
42	<i>Boerhavia erecta</i> L.	Nyctaginaceae	Erect herbs	Aug.-Dec.	India, SriLanka, Nepal, Myanmar, China
43	<i>Achyranthes aspera</i> L.	Amaranthaceae	Large herbs	Oct.-Dec.	SriLanka, Pantropics
44	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Herbs	Sep.-April	SriLanka, Pantropics
45	<i>Alternanthera tenella</i> Colla.	Amaranthaceae	Prostrate herbs	June-Dec.	Native to Tropical America
46	<i>Amaranthus viridis</i> L.	Amaranthaceae	Herbs	July-Dec.	India, Pantropics
47	<i>Lawsonia inermis</i> L.	Lytharaceae	Woody shrubs	Dec.-May	Central Asia and India
48	<i>Helicanthes elastica</i> (Desr.) Danser	Loranthaceae	Semiparasitic subshrubs	Dec.-March	Endemic to India
49	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herbs	Throughout the year	India, Sri Lanka, Pantropics
50	<i>Microstachys chamaelea</i> (L.) Mull.Arg.	Euphorbiaceae	Erect or diffuse herbs	July-Dec.	India, SriLanka, China, Tropical Australia

PLATE 1

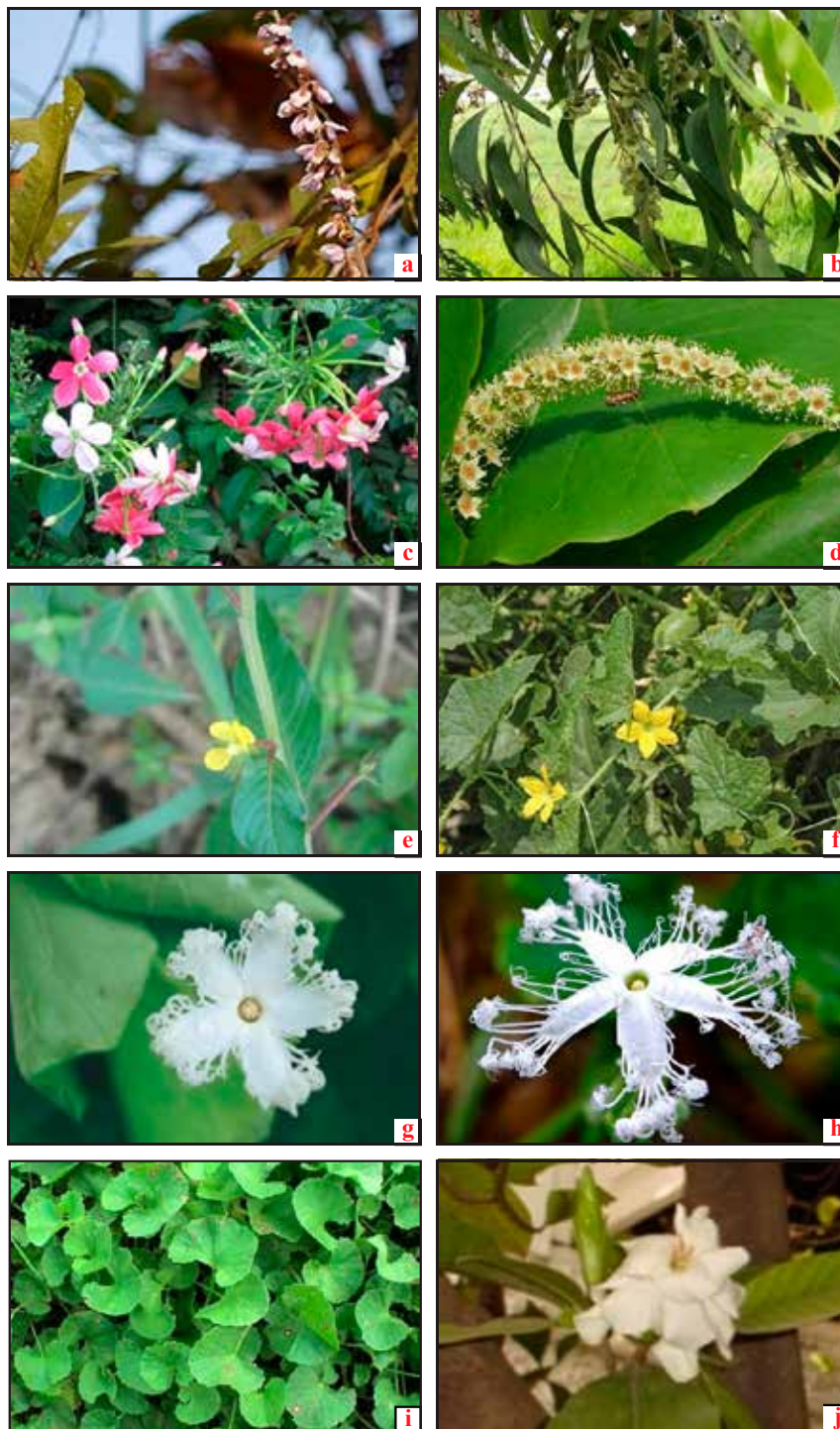


a. *Nymphaea pubescens* Willd.
d. *Portulaca grandiflora* Hook.
g. *Cassia siamea* Lam.
j. *Mimosa diplotricha* C.Wright

b. *Nelumbo nucifera* Gaertn.
e. *Melochia corchorifolia* L.
h. *Crotalaria retusa* L.

c. *Cleome rutidosperma* DC.
f. *Albizia saman* (Jacq.)F.Muell
i. *Delonix regia* (Hook.) Raf.

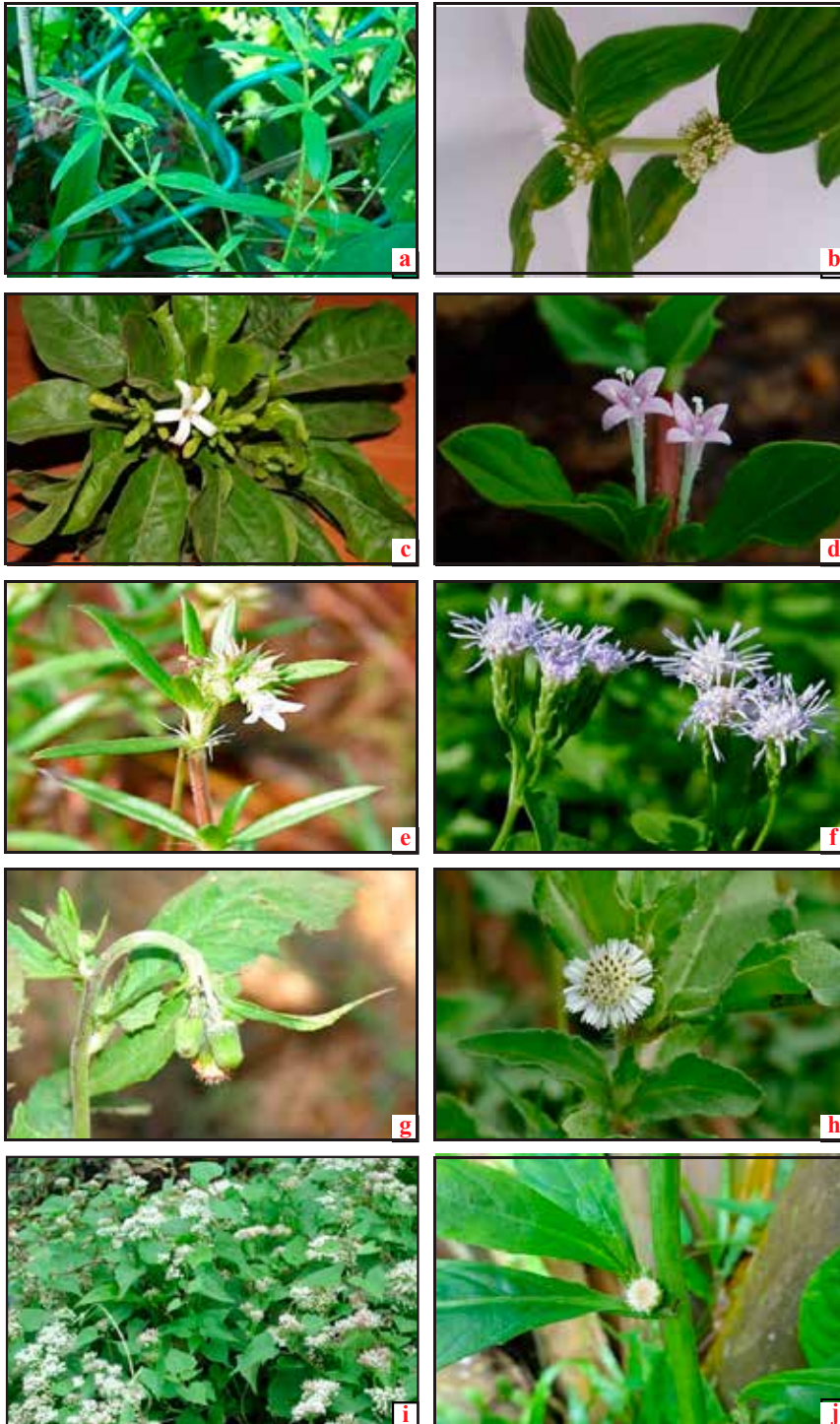
PLATE 2



a. *Pueraria tuberosa* (Willd.) DC.
c. *Quisqualis indica* L.
e. *Ludwigia glandulosa* Walter.
g. *Trichosanthes tricuspidata* Lour.
i. *Centella asiatica* (L.) Urb.

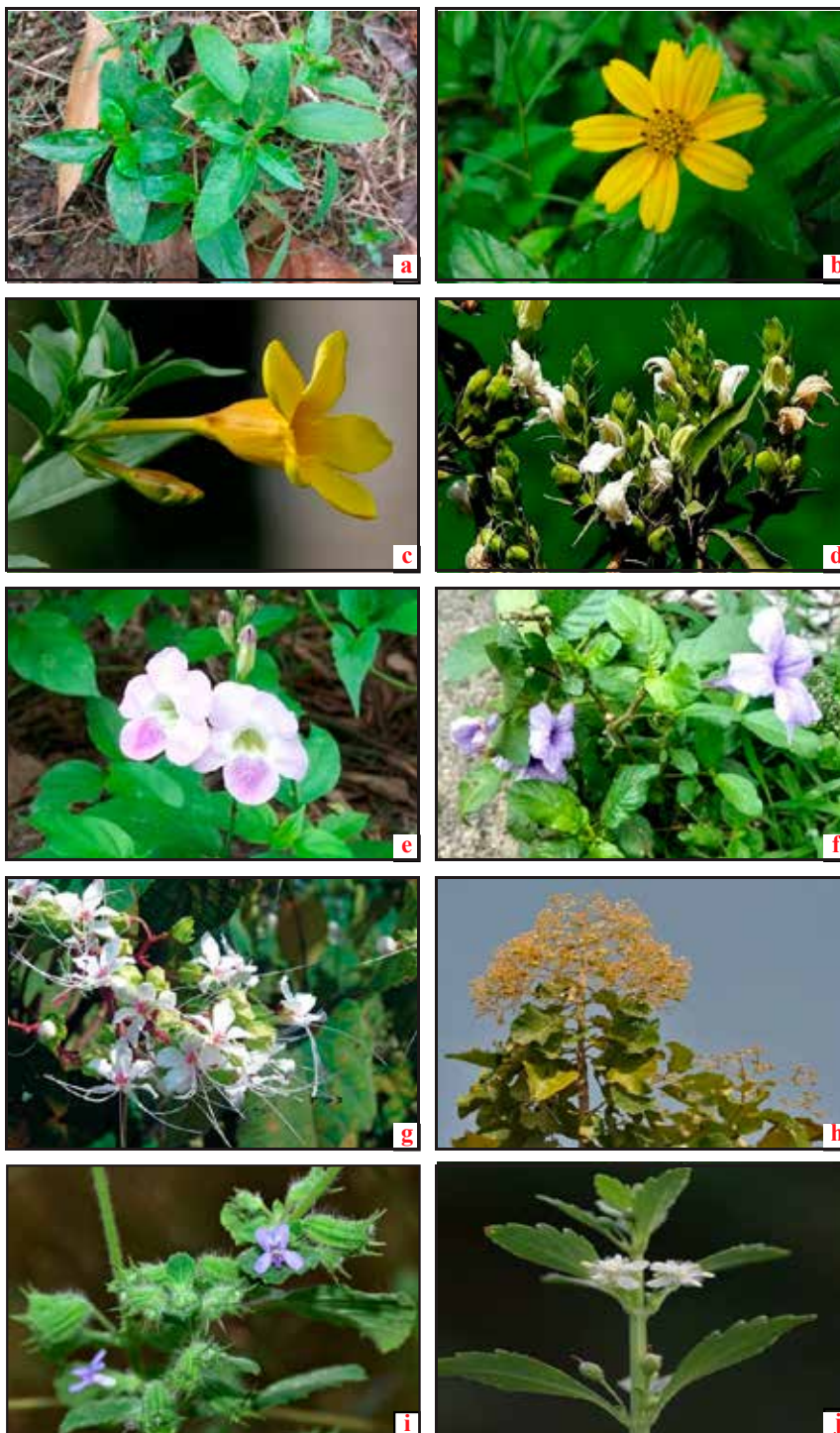
b. A legume of *Racosperma auriculiforme* (Benth.) Pedley
d. *Terminalia catappa* L.
f. *Cucumis melo* L.
h. *Trichosanthes anguina* L.
j. *Gardenia jasminoides* J. Ellis.

PLATE 3



a. *Hedyotis corymbosa* Wall.
b. *Hedyotis auricularia* Walter.
c. *Morinda citrifolia* L.
d. *Spermacoce hispida* L.
e. *Spermacoce ocymoides* Burm.f.
f. *Chromolaena odorata* (L.)R.M King & H.Rob.
g. *Crassocephalum crepidioides* (Benth.)S. Moore.
h. *Eclipta prostrata* (L.)L.
i. *Mikania micrantha* (L.) Willd.
j. *Strutchium sparganophorum* (L.) Kuntze

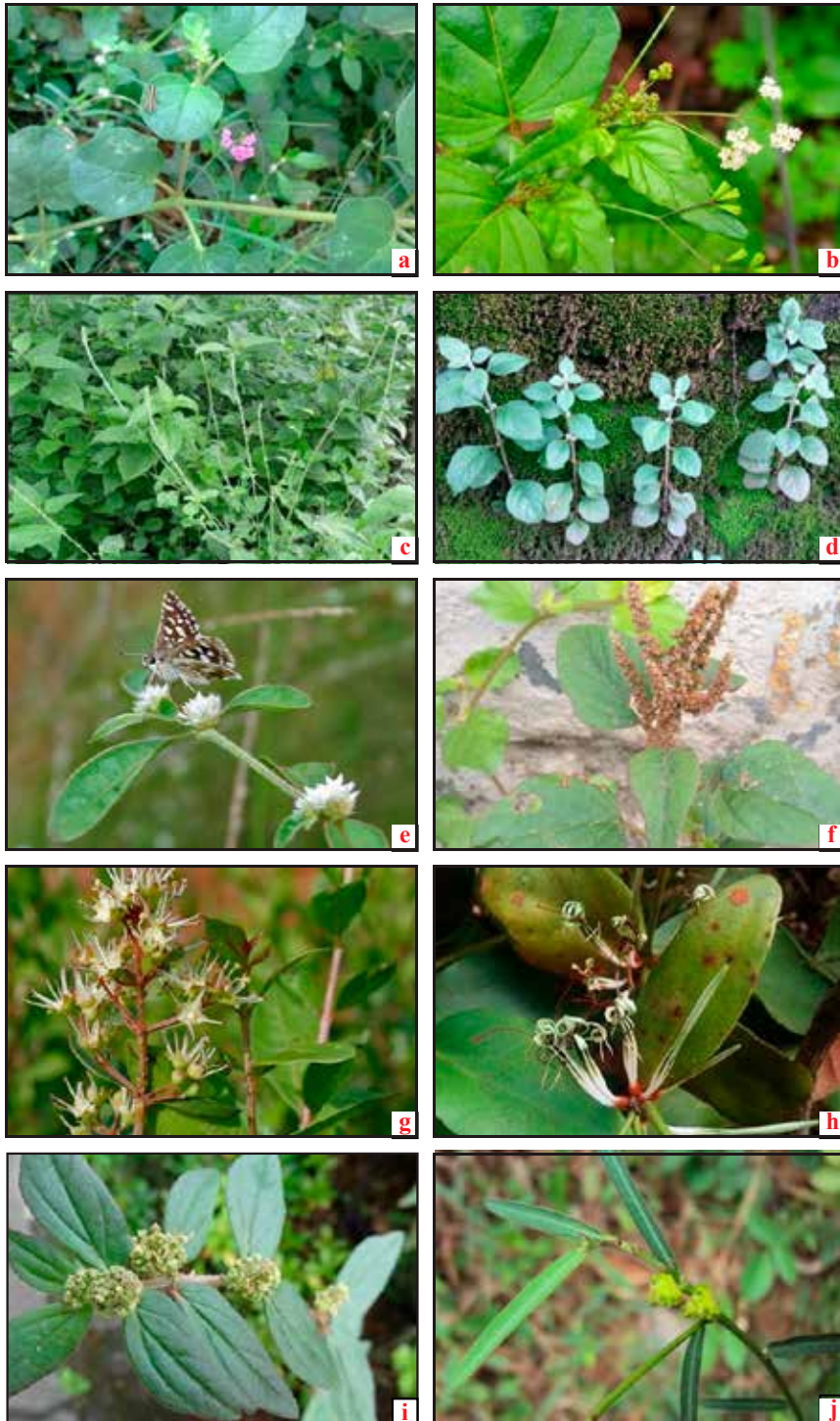
PLATE 4



a. *Synedrella nodiflora* (L.) Gaertn.
c. *Allamanda cathartica* L.
e. *Asystasia gangetica* (L.) T. Anderson
g. *Clerodendrum infornatum* L.
i. *Hyptis suaveolens* (L.) Poit.

b. *Wedelia trilobata* (L.) Pruski.
d. *Adhatoda vasica* L.
f. *Ruellia tuberosa* L.
h. *Tectona grandis* L.f.
j. *Scoparia dulcis* L.

PLATE 5



a. *Boerhavia diffusa* L. b. *Boerhavia erecta* L. c. *Achyranthes aspera* L.
d. *Aerva lanata* (L.) Juss. e. *Alternanthera tenella* Colla. f. *Amaranthus viridis* L.
g. *Lawsonia inermis* L. h. *Helicanthes elastica* (Desr.) Danser i. *Euphorbia hirta* L.
j. *Microstachys chamaelea* (L.) Mull.Arg.

Conclusion

The present floristic studies for the documentation of dicots in Vellayani Lake Area, Thiruvananthapuram District insights on the diversity of dicots in that area. Wetlands are important repositories of aquatic biodiversity. During the last several years, wetlands have been lost and degraded primarily because they were labeled as wastelands and hence did not receive attention in the development plan. They are treated as dustbins for waste water and solid waste. Since wetlands are a common property resource, it is an uphill task to protect or conserve the ecosystem unless the principal stakeholders are involved in this process. Conservation of wetlands for protecting their biodiversity, specific biophysical characteristics and obtaining optimum benefits (ecosystem goods and services) from them requires a major shift in policies related to land and water resources. Therefore, the study and documentation of dicots in this area is an appropriate strategy for the conservation and management of the species for their economic utility and future studies.

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